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# **Taking Care of the Budget? Practice-level Outcomes during Commissioning Reforms in England**

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**February 2016**

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**Abstract**

I investigate whether vesting budgets with doctors impacts treatment decisions and patients outcomes by exploiting the transitional phase of major recent health care reforms in England that passed budgets to consortia of General Practitioners (GPs). Applying difference-in-difference techniques to balanced treatment and control groups, I find that practices becoming actively responsible for consortia budgets engaged in cost-saving prescribing and referral behaviour but that patients in these practices experienced a relative deterioration in the quality of their care. I discuss a number of explanations for these results, including that the reforms incentivised doctors to reduce quality in order to save cash or that they simply distracted those doctors most closely involved.

Keywords: NHS reforms, commissioning, primary care, health care budgets

JEL Classifications: H51; I11; I18; J44; C33

# 1 Introduction

In the tax funded English National Health Service the distinction between organisations that plan and buy (“commissioners”) and those that sell services (“providers”) dates back to the NHS and Community Care Act of 1990 which first split the functions and in effect created a quasi-market in the NHS. Commissioners plan, purchase, and performance manage services on behalf of their resident populations drawing on local health budgets allocated against local population characteristics.<sup>1</sup> Providers constitute a diverse array of primary, secondary, and community health service providers that contract with one or more commissioners to run facilities and clinics or otherwise provide health services.

General Practitioners (GPs) play a role on both sides of the NHS market. As private sector providers, GP practices contract with commissioners to provide primary care services, but they also perform a gatekeeping role also found in many US health maintenance organization (HMOs) and in health systems in Continental Europe. The gatekeeper function means a patient’s ability to access planned tests and treatments at hospitals and other NHS providers can usually only follow a referral from a GP. As such the GP has a “double” agency role (Ellis and McGuire 1986; Blomqvist 1991), acting for the patient in choosing the clinically most appropriate course of action, and an agent for commissioners and ultimately the funders of care in allocating scarce resources. A third set of internal agency relationships — analogous to those found in other markets — is introduced as GPs organise themselves into practices and into wider medical groups (Gaynor 1994).

Until the Health & Social Care Act 2012 commissioning in the English NHS was performed by groups of administrators organised into 151 geographically defined Primary Care Trusts (PCTs). The reforms enacted in 2012 led to the abolition of PCTs and passed commissioning responsibilities to groups of local GP practices bound together into new statutory bodies called Clinical Commissioning Groups (CCGs).<sup>2</sup> Legislation set out a number of requirements for the new bodies, including that all practices must join a CCG (which effectively became membership

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<sup>1</sup>Weighted capitation has been used to allocate NHS resources since the 1970s (Department of Health 2011b). Recent formula include separate components for primary care services, primary care prescribing, and Hospital and Community Health Services. To give a sense of scale, in 2012 the overall primary care services budget was approx £8 billion; primary care prescribing approx £8 billion; and for Hospital and Community Health Services approx £80 billion.

<sup>2</sup>Through their membership of CCGs, GPs obtained two additional duties under the auspices 2012 Act: commissioning secondary and community care services for resident populations, and a duty to assist in improving the quality of primary care.

organisations for local GP practices), and that CCGs were required to have a governing body with at least one GP (leading the CCG as either the Accountable Officer or Chair), although it is clear most CCGs went well beyond this since half of all governing board members are GPs (Iacobucci 2012).

In making GPs commissioners, policy-makers sought to harness GPs' expertise and knowledge of their patients to realise technical and allocative efficiencies, for example in designing services around local preferences, moving care outside hospitals, and reducing information asymmetry in contract negotiations with hospitals (Ham 2010; Timmins 2012). They also sought to incentivise GPs as gatekeepers to achieve cost efficiencies in their own decisions. Evidence from GP fundholding in the 1990s suggests that giving GP gatekeepers hard budgets could reduce referrals (Dusheiko et al. 2006) and prescribing costs (Goodwin 1998), which together account for roughly a quarter of NHS costs.<sup>3</sup> Related evidence for the US also suggests that gatekeepers in HMOs reduce costs in response to financial incentives (Gaynor et al. 2004).

However, GP fundholding also suggests that GPs may respond to financial incentives in holding budgets in opportunistic ways for their own financial gain (Croxson et al. 2001), and the evidence on quality is sparse and inconclusive. Fundholders' patients benefited from relatively shorter waiting times (Dusheiko et al. 2004; Propper et al. 2002), but cross-sectional evidence suggests that they were less satisfied overall and particularly with accessibility of services (Dusheiko et al. 2007). Perhaps with this in mind, architects of the 2012 reforms focused on providing CCG level group incentives that bite on both cost and quality performance and introduced a range of other safeguards.<sup>4</sup> Nevertheless, concerns that GPs could manipulate new powers for their own ends were raised throughout the legislative process, and resurfaced with recent evidence that CCGs have awarded contracts worth £2.4 billion to organisations in which governing body GPs have a financial interest (Iacobucci 2015).

Despite potential to address important research questions (e.g. about the role of incentives and the tension between agency relationships in health care), to date academics have offered little analysis of the reforms. This paper aims to fill this void by providing some initial quantitative insights into effects of the commissioning reforms on practice level outcomes that indicate cost

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<sup>3</sup>There are some important differences with the more recent reforms e.g. GPs volunteered to become fundholders, they held individual budgets and could negotiate prices with hospitals. Under current arrangements, primary care drugs and most hospital treatment prices are set nationally implying that volumes are central to containing costs, budgets are group based and participation is mandatory for all practices.

<sup>4</sup>These incentive schemes are outlined below. Note that the reforms left the remuneration system and incentive structures faced by individual practices as providers of primary care essentially unchanged.

saving behavior and quality of care. Identification is challenging both because GPs took on commissioning within a wider set of reforms and because all GPs legally became commissioners at the same time. I focus on the transitional phase of the reforms, after they were announced but before they became fully operational on 1 April 2013. This helps to disentangle commissioning changes from other elements of the reforms since during this time GPs were taking up new duties but other changes had yet to take hold, but at the cost that only short-term effects can be estimated. These are not necessarily informative about longer term impacts of the reforms; an important caveat to findings.

To estimate effects, I exploit that some GPs actively participated in fulfilling new commissioning duties during the transition by becoming members of CCG governing bodies. Estimates are based on comparing changes in outcomes for these practices against a control group using difference-in-difference techniques. This method relies on an assumption of parallel trends, in this case that outcomes in practices with governing body GPs would have evolved in an identical manner to my control group absent the reforms. Mindful of the threats to identification due to self-selection onto governing bodies, I examine pre-reform trends in outcomes at practices which host governing body GPs and those that do not, allowing me to isolate outcomes where the assumption plausibly holds. Further, I construct a control group made up of practices who hosted a governing body GP outside the treatment window, demonstrating these practices are well matched on pre-reform characteristics. The estimation strategy implies a further important caveat to findings since I can only estimate differential impacts - to the extent that all practices changed behaviour during the reforms, I underestimate effects.<sup>5</sup>

Using these techniques, results suggest that practices taking on budget responsibilities during the transition engaged in more cost saving behaviour but also that their patients suffered from deteriorating care relative to control groups. These findings are robust to controlling for a range of practice and patient characteristics and unobserved factors. The most consistent set of results is on prescribing imply spending on drugs per patient fell by between 0.6 and 1.2 % relative to other practices. Results also suggest that these practices reduced the proportion of patients who were referred to secondary care but then discharged at the first appointment by 1%. While results are imprecisely estimated for quality, they are consistent across specifications and suggest that the proportion of patients admitted to hospitals with conditions that could have been treated in primary care rose by between 1.3 and 3%. In the final section I discuss possible

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<sup>5</sup>Estimating long term effects would require data which is not currently available to this researcher. Estimating overall effects of the reforms would require a different identification strategy.

mechanisms that could account for these results, including the effects of financial incentives, the salience of allocative efficiency issues, or the distraction of doctors from patient care.

## 2 The 2012 Act and Commissioning Reforms

The Health and Social Care Act 2012 introduced major structural changes in the NHS, and were described by then NHS Chief Executive Sir David Nicholson as being so big that “*you could probably see them from space*”. Summaries consistently place commissioning reform top of the changes introduced by the Act (see for example Ham et al. (2015)) although the reforms actually constitute a much wider set of changes. The Nuffield Trust describe these as: (a) giving groups of GP practices and other professionals ‘real’ budgets to buy care on behalf of their local communities; (b) shifting many of the responsibilities historically located in the Department of Health to NHS England, a new, politically independent body; (c) the creation of a health specific economic regulator with a mandate to guard against anti-competitive practices; and (d) the intention to move all NHS hospital Trusts to foundation trust status (semi-autonomous organisational similar to mutual organisations).<sup>6</sup>

Figure 1 sets out a timeline of the reforms, with some key milestones along the top of the arrow. The May 2010 election that led to a hung parliament and the formation of the Conservative and Liberal Democrat coalition is taken to constitute the start of the reform period.<sup>7</sup> Key reform principles were set out in a White Paper in July 2010 and an implementation plan in December 2010 (Department of Health 2010a; Department of Health 2010b). After a lengthy legislative process, including a pause to conduct an extended consultation, the Health and Social Care Act was enacted in March 2012. The majority of changes set out in the legislation formally began on 1 April 2013, including formal transfer of commissioning responsibilities to CCGs, full establishment of the new economic regulator, the new executive agency NHS England, and Public Health England (a new body for public health).

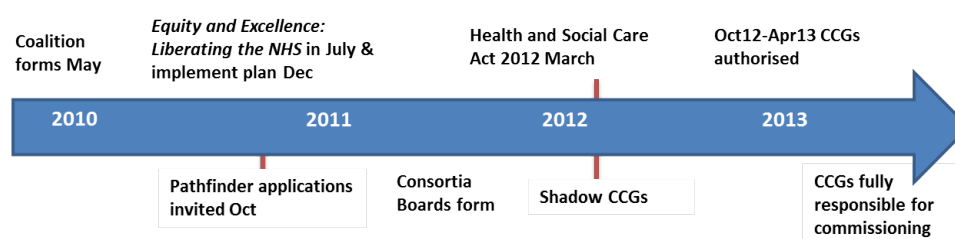
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<sup>6</sup>This is adapted from the summary of the reforms on the Nuffield Trust website: <<http://www.nuffieldtrust.org.uk/our-work/projects/coalition-governments-health-and-social-care-reforms>>

<sup>7</sup>Timmins (2012) provides a lively account of the origins of the reform legislation. During their time in opposition the Conservative party, led by shadow Health Secretary Andrew Lansley, had formulated plans for GP commissioning and revealed the core ideas before the election (see for example Timmins (2012) page 22-25, and the Conservative “White paper” in June 2007 (Conservative Party 2007)). However, the scale and detail of the reforms were not widely understood. For example, the idea that *all* GP practices might be required to be involved in commissioning was mooted out in August 2009, although Lansley states this was only finally decided “in late May or early June” 2010 (Timmins (2012) pages 33).



Figure 1: Commissioning Reform Transition



Despite this, the evidence suggests that many GPs were actively involved in commissioning well before 1 April 2013. This stands in contrast to the changes to the provider side of the market which have been slow to take hold. The captions underneath the arrow in figure 1 highlight the evolution of GP commissioning groups during the transition. Invitations to become pathfinder GP commissioning groups (initially known as GP consortia) were issued in October 2010. These developed rapidly such that half the population was covered by a GP consortia by February 2011, 88% by April 2011 (Department of Health 2011a), and 97% by July 2011.<sup>8</sup> Pathfinder consortia had evolved to 211 Clinical Commissioning Groups (CCGs) by 2013. All CCGs were subjected to an authorisation process in the latter stages of the transition with the first of the 4 authorisation waves taking place in October 2012.

While not fully responsible for commissioning services until April 2013, CCGs were acting as shadow commissioners during the transition, taking over from the outgoing commissioning bodies, PCTs, which were rationalised into clusters from June 2011 and then abolished in April 2013.<sup>9</sup> CCGs began to take on legally delegated authority for commissioning and associated budgets from Primary Care Trusts as early as January 2011 (Department of Health 2010c) and by November 2011 held half of commissioning budgets (Department of Health 2011c). During this time, CCGs were expected to be involved in contract negotiations with hospitals and other providers, and to be taking on responsibility for delivering savings under QIPP, a national efficiency programme (for example through prescribing and referral management schemes) (Department of Health 2010c). More than half of GPs surveyed in July 2011 stated their consortia had factored in QIPP savings into plans for 2011/12 “a great deal” or “a fair amount” (KPMG/IpsosMori 2011). By March 2012 CCGs had been allocated full shadow budgets, were “increasingly taking on day-to-day commissioning responsibilities”, held 59% of

<sup>8</sup>Guardian article “Time for the NHS to act after pause, says Andrew Lansley” 8 July 2011 <<http://www.theguardian.com/healthcare-network/2011/jul/08/time-for-nhs-to-act-after-pause-andrew-lansley>>. The sixth and final wave of pathfinder organisations was announced in October 2011.

<sup>9</sup>Despite this, funding for services continued to be allocated to PCT throughout the transition.

commissioning budgets, and were preparing to take full responsibility for the 2013/14 planning round (NHS England 2012).

Although all practices became part of a CCG, around a sixth of practices were actively participating in commissioning through one of their GPs holding a position on the CCG Board governing body. Governing bodies could be formed with lay members and clinicians with some flexibility, although guidance required a practicing GP to hold at least one of the two main leadership roles of Accountable Officer or Chair. Leaders could be elected or appointed, but had to demonstrate support from members of the CCG.<sup>10</sup> While difficult to establish precisely when individual GPs joined governing bodies, GPs were already moving into shadow consortia by December 2010 (Department of Health 2010c) and by early 2012, 645 GPs held positions on 100 CCGs providing information, suggesting an average of between 6 and 7 GPs per CCG (Iacobucci 2012). In many cases it appears GPs were appointed to positions in early to mid 2011, a finding consistent with 38% of GPs surveyed in July 2011 stating they were personally involved in commissioning “a great deal” or “a fair amount” (KPMG/IpsosMori 2011).<sup>11</sup>

## 2.1 GP incentives under the 2012 reforms

Making GPs commissioners and giving them budgets gives rise to potential conflicts of interests because GPs can both “make” and — as part of a CCG — “buy” services. Outside of their practices many GPs also run additional community and primary care services (for example out of hours GP services) but as commissioners in CCGs, GPs also award and manage contracts. The implication is that under the new commissioning arrangements, GPs could award contract for services to themselves (for example see Smith et al. (2010)). A related concern was that conflicts of interest could arise if GPs could profit from reducing the quality or quantity of care for their patients below an efficient level, for example prescribing less or making fewer referrals to hospitals in their gatekeeper role. This would free up funds for the CCG; if these could be distributed to GPs or invested in new services run by GPs, then GPs might benefit by reducing care quantity or quality. Moreover, since commissioning budgets are large compared to other services – a 1% surplus in these budgets is roughly 8% of primary care budget – savings would

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<sup>10</sup>Legislation and guidance covers a number of governance arrangements including a constitution, register of interests and governing body (NHS Commissioning Board 2012b; NHS Commissioning Board 2012a).

<sup>11</sup>In Stoke for example, the GP chair and six GP leads were appointed in January 2011. See <<http://www.gponline.com/consortia-stoke-on-trent-gps-progress/article/1068733>>. I discuss how I deal with uncertainty over timing of GP participation in commissioning in the empirical section.

lead to scope for substantial gains.<sup>12</sup>

The reforms sought a balance between encouraging GPs to engage in cost saving and quality enhancing activity while safeguarding against such opportunistic behaviour. Although CCGs would (largely) control how savings on commissioning budgets could be spent, they could not simply be distributed to practices but had to be reinvested in services. Guidance ensures that individuals commencing a position on a CCG governing body must declare relevant financial interests, e.g. holding shares in a company providing health care, and must leave board discussions relating to these interests.<sup>13</sup> To protect quality, a quality bonus (up to £5 per patient, roughly 3.5% of the GP budget) can be distributed to practices for improving services if the CCG meets quality targets across specified domains, albeit is only achieved if the CCG is in financial surplus. Critically for this research, although the quality bonus did not begin until 2013, announcements in late 2010 indicated CCGs would inherit legacy financial position of PCTs accumulated in 2011/12 & 2012/13 (Department of Health 2010c). CCGs could draw down any surpluses from this period after 1 April 2013, giving them incentives to make savings during the transition.

Aside from these changes, important features of the primary care market remain unaltered. Patients still choose a single local practice at which to register, accessing (publicly funded) health care services is through a consultation with a GP or via emergency care services. GP gatekeepers continue to organise themselves into private practices competing with other local practices for patients, and continue to be paid according to the characteristics of their registered population, retaining any surpluses after incurring costs for patient care. Capitation means that the level of referrals and prescribing does not affect individual practice profits directly. In secondary care, prices for hospital treatments continue to be nationally fixed so that GPs (and CCGs) margins of adjustment are on reducing volumes, and the reforms coincided with no major changes in hospitals e.g. closures or new openings.

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<sup>12</sup>See for example the Channel 4 story on 2 March 2011 <<http://www.channel4.com/news/leaked-document-shows-how-doctors-can-profit-from-nhs-reform>>.

<sup>13</sup>Additional safeguards included not passing full responsibility for primary care commissioning to CCGs (these remained with the central body NHS England, although are now being passed to CCG), statutory duties for CCGs regarding patient care, oversight by central bodies, including a body with a specific remit to prevent anti-competitive behaviour.

### 3 Empirical Analysis

Evaluating the quantitative impacts of the reforms is complicated by a number of factors, not least that all GPs became obliged to participate in commissioning services, and because a range of other system changes were made alongside commissioning reforms. I circumvent these problem as far as I am able by focusing on the transitional phase of the reforms and by exploiting variation in the degree to which GPs participated with the new commissioning responsibilities.

Specifically, my empirical strategy centres on practice level difference-in-difference regression analysis comparing changes in outcomes in practices most strongly associated with the commissioning reforms (the “treatment”) before and after the initiation of the reforms (the “policy off/on” periods) relative to changes in the outcomes in a control group of practices. The treatment and outcome measures and strategies for construction of control groups are described further below. Based on the information captured in Figure 1, for the quantitative analysis I take the May 2010 election that resulted in a hung parliament to be the end of the control period. The tightness of the election and the fact that plans for health reform were not well understood make it unlikely that GP would have taken any actions in anticipation of the reforms prior to this point. Although the reform legislation was not enacted until March 2012, I use April 2011 as the start of the policy on period. By this point the vast majority of consortia had been formed, many GPs were actively involved in new commissioning duties, and had incentives to make cost savings. To mitigate risk from potential confounders, I use the narrowest window possible, using financial year 2009/10 as my control period, and financial years 2011/12-2012/13 as the policy on period.

#### 3.1 Treatment and Outcome measures

Since all GP practices joined a CCG on 1 April 2013, I rely on a treatment intensity indicator that captures the degree to which practices actively participated in commissioning duties during the transition. Specifically, I separate GP practices into three groups based on the participation of individual GPs on CCG governing bodies during and after the transition. Allocation of practices into groups rests on a database that combines information about CCG governing body membership (obtained under Freedom of Information (FOI) requests, CCG Board documents, and local press reports) with GP employment histories since 1 April 2009 obtained from the NHS Information Centre. Since CCGs were unable to provide data on the dates GPs started on

governing bodies if these were before 1 April 2013, I make the assumption that governing body GPs had begun by 1 April 2011, an assumption supported by the evidence described above.<sup>14</sup> Full details of the construction of the underlying database are described in the Appendix.

The first group — which I call `GOV. BODY` — is composed of 1151 practices where at least one GP held a position on the CCG governing body during the transition. To be in this group, I require a governing body GP to be at the practice throughout the whole of the treatment period, i.e. the GP must remain at the practice and on the Governing body up to 1 April 2013. A `SELECTED CONTROL` group contains two subsets of practices: 140 where a resident GP joined a governing body but only after 1 April 2013; and a smaller subset of 21 that hosted a governing body GP throughout the control period but not the transition i.e. a governing body GP was at the practice during 2009/10 but left prior to 1 April 2011. The third group — `ALL OTHER` — is an unrestricted control group composed of all practices not included in the `GOV. BODY` group. Note, however, that I drop 227 practices from the analysis altogether, either because a GP practices in a different CCG to where they act as a Board member (5 practices), because the GP was at the practice or governing body for only part of the treatment period (109 practices), or because the practice moved to a different postcode sector during the period (113 practices).

Outcome measures were chosen to represent practice level outcomes over which GPs can exert some degree of control through patient care decisions and that exhibit substantial unexplained variation across practices. My main cost-saving measures are based on prescription costs and referral to secondary care which collectively account for a large proportion of health spending (around £25 billion p.a., roughly a quarter of the NHS budget). My principal quality measures are the rate at which patients are admitted to hospital in an emergency with conditions that are avoidable with good primary care, and patient experience measures generated from the GP patient survey. I use other emergency admissions (that is admissions which are not avoidable however good the primary care), and inpatient waiting times as placebo quality outcomes since these should in theory not change under the commissioning reforms.

Prescribing costs reflect GP decisions about who should receive medication and the type of medication to prescribe. Many studies point to substantial clinically unwarranted variation in practice prescribing. For example the National Audit Office reported in 2007 that £200 million could be saved on prescribing costs each year without compromising patient care (National Audit Office 2007). Further, several national and local initiatives have attempted to monitor

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<sup>14</sup>Note that if GPs started later than this results would be attenuated.

prescribing and drive up prescribing productivity without compromising patient care e.g. the Better Care, Better Value indicators of the NHS Institute for Innovation and Improvement, PCTs and CCG-led prescribing schemes. Prescription costs per patient are generated from practice level prescribing data from the HSCIC Information Centre and are calculated as the total cost of items prescribed divided by patient counts, where the numerator is the net ingredient costs of all medicines, dressing and appliances excluding any discounts and container costs.

A second set of cost saving outcomes centre on GP referrals to secondary care. A recent report (Imison and Naylor 2010) found that GPs make around 9 million referrals each year at a cost of roughly £15 billion with evidence of very considerable (up to ten-fold) variations between GPs and between GP practices. The authors conclude that, *“The available evidence suggests that not all referrals are necessary in clinical terms, and a substantial element of referral activity is discretionary and avoidable.”* They go on to describe a variety of NHS referral management initiatives that have been put in place in a bid to control the cost and efficiency of GP referrals - from clinical guidelines and financial incentives to more drastic measures such as referral management centres that audit all referrals and can reject those deemed to be inappropriate. I use two variables based on referrals in the empirical work. The first is the rate at which patients are referred to hospitals, which is generated at the practice level using data for first outpatient attendances recorded in the Hospital Episode Statistics (HES) database, counting only referrals from GPs matching a practice code in my dataset. The second is the proportion of first hospital outpatient attendances that resulted in the patient being discharged. There is evidence that some CCGs use this metric to audit or benchmark practices with a view to reducing costs on the basis that it may capture inappropriate referrals.<sup>15</sup> It follows that a reduction in this measure could indicate an increased focus on making cost reductions in referrals.

My main indicator of quality and patient outcomes is based on the rate of potentially avoidable hospitalisations (PAH).<sup>16</sup> Since the 1990s, avoidable hospitalisations have been interpreted as measuring aspects of primary care including overall system performance (e.g. Thygesen et al. (2015), OECD (2012)); quality of diagnosis and chronic disease management (e.g. Starfield et al.

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<sup>15</sup>Board documents from Hull CCG, Stafford and Surrounds CCG, Western Cheshire CCG, Warrington CCG, and West Kent CCG.

<sup>16</sup>Throughout this paper I refer to such admissions as avoidable hospitalisations. Terminology varies. The conditions are sometimes collectively known as Ambulatory Care Sensitive Conditions (ACSCs), with resulting admissions being variously described as potentially avoidable hospitalisations, preventable admissions, or admissions for avoidable hospital conditions (AHCs).

(2005)), continuity of care (e.g. Cheng et al. (2010), Nyweide et al. (2013)), or the accessibility of primary care (e.g. Basu and Friedman (2001), Rosano et al. (2013), Weissman et al. (1992)). I build on a recent study, Harrison et al. (2014), that uses this outcome measure in a study of physician incentives in an NHS context.

The idea behind this quality measure is that admitting patients with some presenting conditions to a hospital setting could have been avoided by appropriate primary care, either by preventing the onset of avoidable disease (e.g. vaccine-preventable conditions), managing an acute illness (e.g. dehydration), or managing a chronic condition effectively (e.g. diabetes) (Busby et al. 2015). Although in some cases, the admission may not reflect a failure on behalf of a primary care – for example the patient may have chosen not to visit her GP – variation over time at the same practice, controlling for patient characteristics should capture some aspects of quality.<sup>17</sup> With no universal definition of which hospital admissions are avoidable I follow Purdy et al. (2009) using ICD-10 codes for a set of 19 presenting conditions (using the wider set of diagnosis codes these authors describe). I generate practice level counts of avoidable and unavoidable emergency admissions, first dropping duplicate records from the HES data and excluding transfers before collapsing the data to practice level.<sup>18</sup>

### 3.2 Control groups

Given that I use a difference-in-difference approaches to estimate effects of the reforms, it is critical that outcomes in the treatment group of practices should be expected to evolve in a way that is identical to the control group, however defined, in the absence of treatment. However, because GPs self-select onto CCG governing bodies, it may be that either the governing body GPs and/or the practices at which they operate could be systematically different to other practices – for example, GPs could have different levels or skills, experience or have different practice styles, and their practices could cater for a different mix of patients. In this section, I

<sup>17</sup>Weissman et al. (1992) state that “... some hospital admissions, such as those for immunizable conditions, are almost always avoidable. Even a single case may be cause for concern. However, for most AHCs, being avoidable is a matter of degree. Because treatment of patients with chronic conditions such as asthma or congestive heart failure is complex, monitoring AHCs may be most useful when their rates deviate substantially from some prescribed norm.”

<sup>18</sup>Ansari et al. (2012) provide a slightly different way to define ACSCs on the basis of ICD-10 diagnosis codes of admitted patients. I prefer the Purdy et al. (2009) definition for this analysis as it is derived from NHS practices. The full set of ICD-10 codes is in the Appendix. Note that I do not count avoidable admissions for dental problems as in the NHS these are not the responsibility of GPs. In generating measures, I retain emergency admissions by keeping HES data records with admimeth codes 21: via A&E; 22: via GP; 23 via Bed Bureau; 24: via OP clinic; and then drop transfers which I define as those with admisorc code 51,52 or 53.

assess the validity of the two control groups of practices described above – the unrestricted set (ALL OTHER) and the restricted set (SELECT CONTROL) – by comparing pre-treatment trends in outcomes and examining pre-treatment characteristics across the three groups.

I begin with visual inspection of trends before and after the announcement of the reform, shown in Figures 2-4. In all plots the x-axis records the time while the y-axis shows the monthly evolution in the outcome variable for two distinct groups of practices: those where at least one GP held a position on the governing body of the local commissioning group (dashed blue line) during the transition and those with no GP representative on the local Board. To construct indicators, outcomes are first normalised by practice list size for each practice-month and then collapsed over the two groups weighting by list size, before re-basing so that April 2008 is equal to one.<sup>19</sup>

Each figure contains four plots: the top left quadrant shows the raw quarterly average for reference while the other three quadrants smooth the data separately on either side of April 2010 which is the last month before the Coalition government took office. The top right quadrant uses a locally weighted regression (Lowess) using a bandwidth of 80% of the observations on either side of the break, while the bottom quadrants smooth the data using local polynomials of degree 0 (bottom left) and degree 2 (bottom right). For both polynomials, an Epanechnikov kernel function is used and the bandwidths (displayed under the Figure), selected automatically by STATA’s rule of thumb bandwidth estimator, lie between 5 and 7.5 months.

Figure 2 maps out the progression of prescription costs per patient for treated and non-treated GP practices. All plots within this figure suggest that both sets of practices followed highly similar trends prior to the formation of the coalition. It is difficult to distinguish a pattern in the raw data, but when looking at the smoothed data, a slight gap between the groups appears following the announcement of the reforms appears then appears to close, at least in part, by the end of 2012/13. The pattern suggests that the treated practices reduced relative prescription costs per patients initially although perhaps only on a temporary basis.

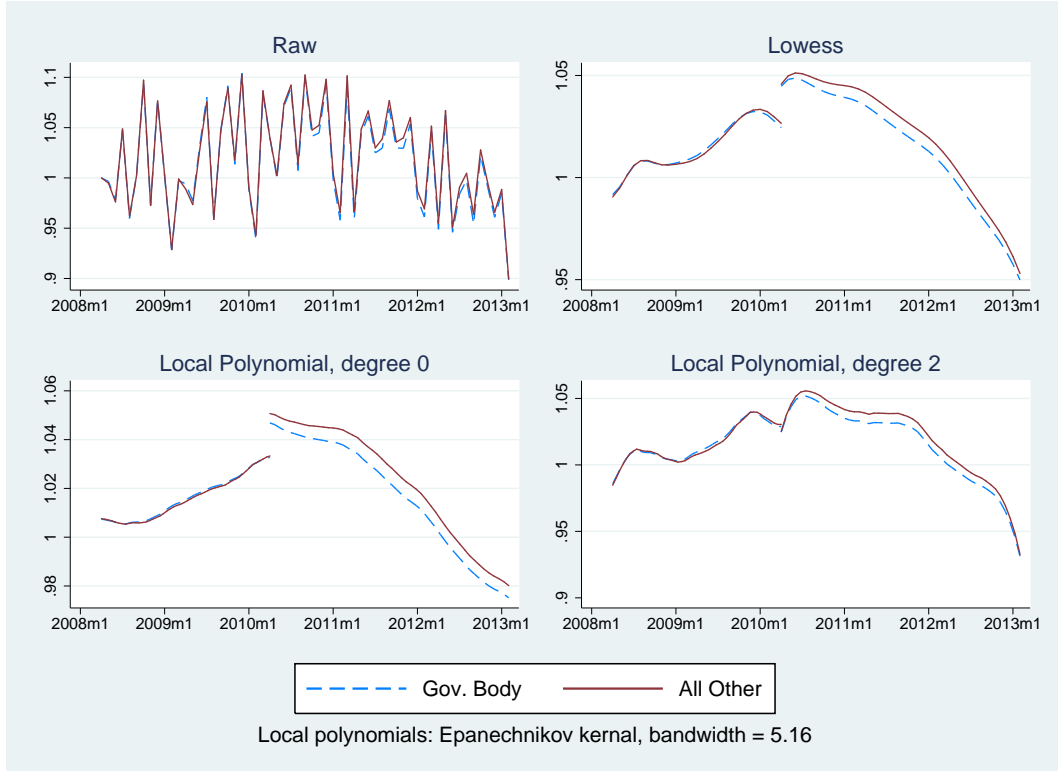
Figure 3 charts the progression of avoidable hospitalisations per patient for treated and non-treated GP practices. All plots within this figure again suggest that all practices were on highly similar trends prior to the formation of the coalition. A more clear divergence in trends appears for this variable following the announcement of the reforms. The pattern suggests that the a

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<sup>19</sup>For these figures, I use only those practices which have data in each and every month to avoid outcomes being skewed by attrition and new joiners.



Figure 2: Drug Expenditure per patient



greater proportion of patients at treated practices were avoidable admitted to hospital following the reforms and that this increases over time.

Figure 4 charts the progression of referral per patient for treated and non-treated GP practices. In contrast to previous figures, all plots within this figure suggest that treated and non-treated practices were on diverging trends prior to the formation of the coalition: the referral rate in the treated practices was increasing at a materially faster rate than in other practices.<sup>20</sup> While there is some suggestion that this phenomenon reverses following the commencement of the reforms, it highlights that application of difference-in-difference techniques using an unrestricted control group may be problematic because post reform outcomes for non-treated practices will not necessarily provide a good counterfactual for the treated group of practices.

Table 1 reports mean pre-transition practice level characteristics (for 2009/10) for three groups of practices. The third and sixth columns report difference in mean tests to assess whether the treatment group differ along observable dimensions to the potential control groups. Results

<sup>20</sup>The sharp fall towards the end of 2012/13 may be explained at least in part by data recording - the HES data provides only finished hospital episodes so that data to 31 March 2013 will exclude any episodes started before this date but where treatment has not finished. I intend to re-examine this issue when further HES data is made available to me.

Figure 3: Avoidable Hospitalisations per patient

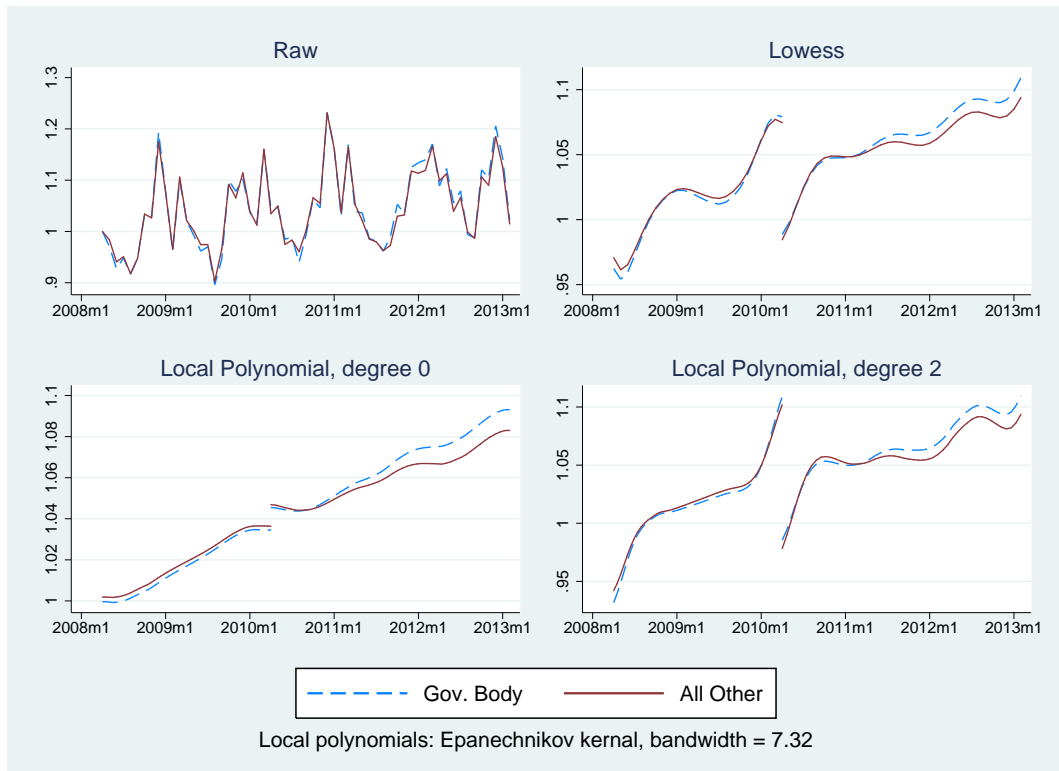


Figure 4: Referrals per patient

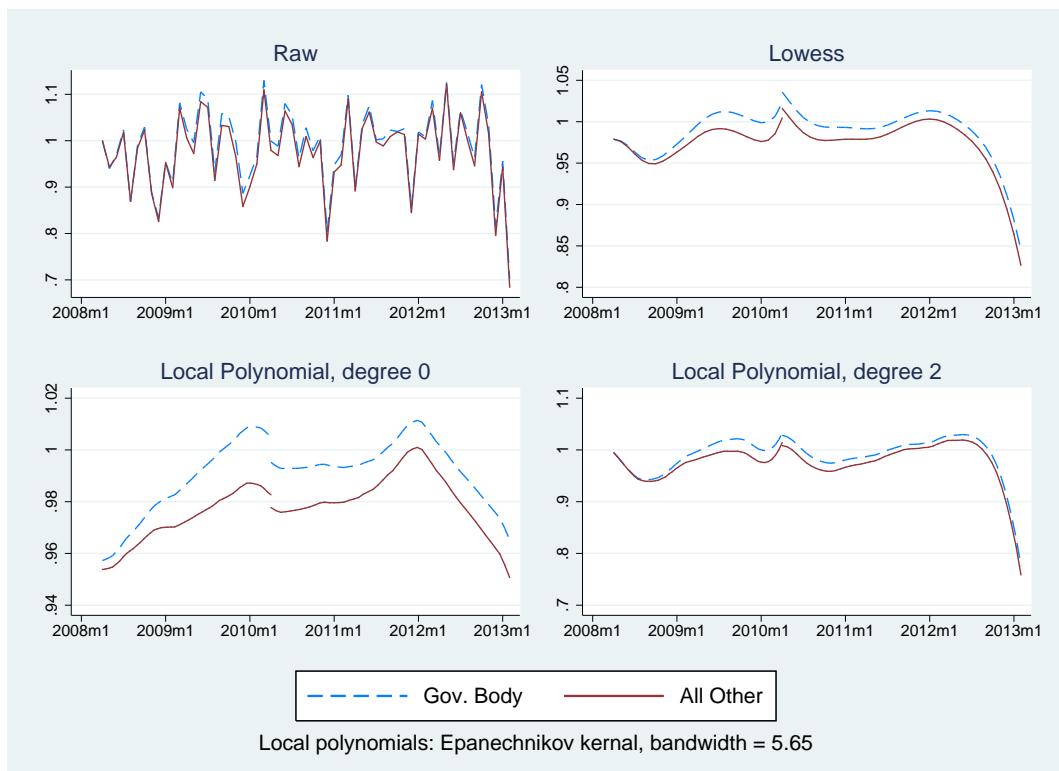


Table 1: Balancing Pre-Transition Practice Characteristics

Variable	(1) Gov Body	(2) All Other	(1)-(2)	(4) Gov Body	(5) Select Control	(4)-(5)
Observations	1151	6185		1151	161	
Patient count	9,402.01	6,499.81	-2,902.20***	9,402.01	9,543.63	141.62
GP count	6.14	4.19	-1.95***	6.14	6.50	0.37
% Aged 65+	15.78	15.36	-0.42*	15.78	16.06	0.28
% Ethn. White	0.88	0.85	-0.03***	0.88	0.90	0.02
% Unemployed	0.04	0.05	0.01***	0.04	0.04	-0.00
% Male	0.42	0.43	0.01***	0.42	0.42	-0.00
% CHD	3.51	3.46	-0.05	3.51	3.56	0.05
% Stroke or TIA	1.71	1.60	-0.11***	1.71	1.77	0.06
% Hypertension	13.24	13.24	0.00	13.24	13.54	0.31
% Diabetes	4.13	4.20	0.07*	4.13	4.01	-0.12
% COPD	1.58	1.57	-0.01	1.58	1.57	-0.01
% Epilepsy	0.61	0.59	-0.01*	0.61	0.60	-0.01
% Hypothyroidism	2.86	2.80	-0.06*	2.86	2.88	0.01
% Cancer	1.30	1.23	-0.07***	1.30	1.36	0.06
% Mental Health	0.76	0.77	0.01	0.76	0.75	-0.01
% Heart Failure	0.75	0.72	-0.03**	0.75	0.77	0.02
% Palliative	0.11	0.11	-0.01*	0.11	0.11	-0.00
% Dementia	0.46	0.42	-0.04***	0.46	0.47	0.01
% Kidney Disease	3.36	3.10	-0.26***	3.36	3.48	0.12
% Atrial Fibr.	1.39	1.28	-0.10***	1.39	1.43	0.04
% Obesity	8.17	8.47	0.30**	8.17	8.28	0.11
% Learning Diff.	0.31	0.30	-0.01	0.31	0.31	-0.00

*Notes:* Standard errors clustered at the practice level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Based on a balanced panel of practices with data for quarters in 2009/10, 2011/12 and 2012/13; Practices with less than 1000 patients, moving postcode district, and with a governing body GP for part of the treatment period have been dropped.

highlight significant differences between governing body practices and the unrestricted control group: governing body practices are considerably larger, having on average 2 more GPs and 3,000 more patients, and have a greater share of white, and a marginally smaller share of male and unemployed patients. There are also several significant differences in the proportions of patients with specific health conditions which suggest that governing body practices have sicker patients. In contrast, the restricted control group of practices appear well matched to the treated group, with no significant differences along all the observed dimensions. These similarities in observed pre-transition characteristics suggest this latter subset of practices may provide a good control group.

Table 2 evaluates whether there are significant differences in trends in the outcomes in governing body practices and the restricted control groups in the pre-reform period (quarters in 2009/10) by regressions using a sample including only these two groups. I proceed by regressing each of the outcome variables described above in turn on a time trend and a time trend interacted with

Table 2: Pre-Treatment Trends, Governing Body and Select Control groups

	(1) Prescribing cost pp	(2) Referral rate	(3) Referred but discharged %	(4) PAH rate	(5) Other NE rate	(6) Avg. inpatient Wait
trend	0.0053*** (0.0017)	-0.0402*** (0.0118)	0.1815 (0.1969)	0.0380*** (0.0073)	-0.0017 (0.0049)	0.0279*** (0.0036)
Gov.Body $\times$ trend	0.0004 (0.0018)	0.0218* (0.0121)	-0.1141 (0.2058)	0.0077 (0.0078)	0.0000 (0.0052)	-0.0015 (0.0038)
Practice FX	✓	✓	✓	✓	✓	✓
Observations	5248	5248	5248	5248	5248	5248
R-squared	0.977	0.935	0.902	0.933	0.904	0.791
trend	0.0038* (0.0021)	-0.0365*** (0.0117)	0.2059 (0.2134)	0.0418*** (0.0092)	-0.0099* (0.0060)	0.0286*** (0.0043)
Gov.Body $\times$ trend	0.0006 (0.0018)	0.0227* (0.0121)	-0.1140 (0.2058)	0.0083 (0.0078)	0.0012 (0.0050)	-0.0012 (0.0038)
Practice FX	✓	✓	✓	✓	✓	✓
Additional controls	✓	✓	✓	✓	✓	✓
Observations	5248	5248	5248	5248	5248	5248
R-squared	0.978	0.936	0.913	0.933	0.905	0.793

Notes: Standard errors clustered at the practice level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. Additional controls are GPs per 1000 patients, share patients aged 65 + and proportions of patients registered as having each of 16 health conditions.

an indicator for Gov.BODY, including only practice fixed effects in the top panel and adding patient and practice controls in the lower panel. The interaction term indicates whether there are significant difference in pre-treatment trends conditional on the controls included. None of the coefficients are significant, again with the exception of the referral rate where the trend is significantly less negative in the group of practices which became represented on governing bodies during the transition. This provides further support for the use of this control group.

### 3.3 Model specification

I adopt a standard practice level difference in difference approach, exploiting the panel dimension of the data (Baum-Snow and Ferreira 2014):

$$y_{pt} = \beta.GB_{p.post} + \gamma'.controls_{pt} + \phi_p + \phi_t + \epsilon_{pt}$$

Where the dependent variable  $y_{pt}$  is the natural log of outcome variable  $y$  at GP practice  $p$  in

quarter  $t$ . The treatment variable  $GB_p$  is an indicator variable denoting GP practice participation in new commissioning responsibilities, which is proxied by governing body membership during the transition as described above. This is interacted with a dummy variable  $post$  that takes the value of 1 for quarters from 2011/12 onwards but is zero otherwise. All regressions include GP practice fixed effects  $\phi_p$  to remove time invariant unobservable factors, and quarter dummies  $\phi_t$ . With this strategy the separate elements  $GB_p$  and  $post$  are subsumed within these fixed effects so do not appear in the estimated equation. The coefficient on the interaction  $\beta$  is the difference in difference coefficient denoting the average changes in outcomes during the transition for practices represented on a CCG governing body relative to the control group of practices. I run regressions of this form on two sets of specifications distinguishable by practices constituting the control group. In the first the control group is made up of all practices, while in the second it is restricted to practices that host a governing body GP but only at a time outside the treatment window.

Note that using the deviations from mean estimator should help with uncertainty over timing of effects, arising either because GP behavioural responses to new commissioning responsibilities may take time or because any GPs actually joined governing bodies later than I assume. Any inaccuracies in this regard will however attenuate results. This strategy also implies that I eliminate time invariant practice unobservables from the estimation. This is potentially important since research suggests time-invariant physician factors (e.g. practice style, heterogeneous preferences, gender etc) are important factors in explaining variation in treatments patients receive (Liu and Ma 2013). Including quarter fixed effects eliminates national time trends in outcomes and should also partial out other national effects that may arise e.g. due to other aspects of the reforms.

It remains possible that unobserved factors correlated with GPs decisions to join governing bodies could affect outcomes. To assess this I include a range of time varying controls and fixed effects in supplementary specifications beyond the minimal one described above. Patient and practice characteristics are captured by the number of GPs per 1000 patients at the practice; and the proportions of patients registered as having each of 16 health conditions (e.g. CHD, Hypertension, Diabetes, COPD, Dementia, Obesity, Mental Health) which are interpolated from annual data. To account for further unobserved heterogeneity, for example changes in socio-economic conditions, the funding environment, and locally-led healthcare policies (e.g. availability of services), I interact region, PCT, and/or CCG dummies with quarter fixed effects.

These additional specification help to evaluate the extent to which threats to identification, for example patient sorting between practices in response to changes in GP behaviour, may be driving results.

## 4 Results

Results are based on a balanced panel of GP practices for quarters in financial years 2009/10, 2011/12 and 2013/14. As noted above, sample restrictions include dropping practices which have a GP on a governing body in a different CCG, that had a GP on a governing body for part of the treatment period, and practices that moved to a different postcode district during the sample period. I also drop a small number of practices with less than 1000 patients such that I restrict attention to a total of 7,236 practices in England. Table 3 presents summary statistics for the three outcome and control variables. The outcome variables presented in this table are normalised by counts of patients at practices in each quarter (in the regressions I take the natural log of these values). The table shows that on average there is one GP per every 1400 patients at the practices in my sample period, and around 15% of patients are of retirement age. The most common health conditions patients are registered for are Hypertension, Obesity, and Diabetes; the least common (with a mean practice value of less than 1%) are Palliative care, Dementia, Epilepsy, Learning Difficulties, and Mental Health.

### 4.1 Unrestricted Control Group

This section reports results from using a difference-in-difference approach using the relatively unrestricted control group represented by the practices in the ALL OTHER group. The unconditional graphical evidence above is consistent with parallel pre-treatment trends for prescription cost per patient and the avoidable hospitalisation rate but not for the referral rate. On the basis of these trends, Table 4 reports results only for the first two outcomes: prescription costs per patient in columns (1)-(4) and the avoidable hospitalisation rate in (5)-(8). For each outcome the first column reports findings using only practice fixed effects and quarter dummies. Each subsequent columns progressively adds to this a minimal set of controls: in the second column I add region-quarter effects (which also correspond to Strategic Health Authorities which are coterminous), in the third I add GPs per 1000 patients and patient controls, and in the final column I introduce PCT-quarter and CCG-quarter effects. As with all subsequent regressions,

Table 3: Descriptive Statistics

	count	mean	sd	min	max
Prescribing cost per patient	88032	37.69	9.37	0.89	259.47
Referrals per 1000 patients	88032	50.72	20.84	0.31	201.78
% of referrals discharged at 1st appointment	88032	28.79	10.45	0.00	100.00
Avoidable Hospitalisation per 1000 patients	88032	5.85	2.41	0.09	36.40
Other emergency admissions per 1000 patients	88032	15.84	4.95	0.89	93.95
Average inpatient waiting time (days)	88032	43.67	7.76	0.00	122.02
GPs/1000 patients	88032	0.69	0.30	0.09	7.33
% Aged 65+	88032	15.93	5.71	0.00	48.12
% CHD	88032	3.43	1.17	0.00	10.19
% Stroke or TIA	88032	1.67	0.64	0.00	6.45
% Hypertension	88032	13.62	3.48	0.06	37.52
% Diabetes	88032	4.54	1.24	0.00	15.06
% COPD	88032	1.67	0.84	0.00	8.16
% Epilepsy	88032	0.61	0.21	0.05	3.85
% Hypothyroidism	88032	2.99	0.97	0.06	8.24
% Cancer	88032	1.53	0.63	0.00	5.32
% Mental Health	88032	0.81	0.39	0.00	11.90
% Heart Failure	88032	0.72	0.32	0.00	3.89
% Palliative	88032	0.17	0.18	0.00	3.37
% Dementia	88032	0.47	0.35	0.00	9.38
% Kidney Disease	88032	3.28	1.74	0.00	18.11
% Atrial Fibr.	88032	1.38	0.61	0.00	5.20
% Obesity	88032	8.80	3.00	0.35	41.54
% Learning Diff.	88032	0.34	0.24	0.00	5.11

*Notes:* Based on a balanced panel of practices with data for quarters in 2009/10, 2011/12 and 2012/13; Practices with less than 1000 patients, moving postcode district, and with a governing body GP for part of the treatment period have been dropped.

I cluster standard errors at the GP practice level to account for arbitrary correlation in errors over time.

For both outcome measures results are reasonably stable across specifications. Although there is a clear change in the coefficient on the difference-in-difference interaction for prescribing costs when the practice and patient controls are introduced it is not statistically significant. Interpreting on the basis of columns (4) and (8), these results are consistent with practices with governing body GPs reducing costs but lowering quality during the transitional phase of the reform relative to other practices. The effects are small - prescribing costs per patient are 0.5% lower while the avoidable hospitalisation rate increases by around 1.3%. The coefficients on control variables are mostly consistent with intuition. An increasing share of elderly patients is associated with both increased spending on drugs and a greater proportion of avoidable hospitalisations. The disease prevalence measures are generally intuitive, but throw up some unexpected results such as the sign on the share of cancer patient coefficients in the prescribing regressions. It could well be that correlations between conditions could account for these effects. Finally, the positive association between the GP patient ratio and the avoidable hospitalisation rate is unexpected, and could perhaps reflect issues with continuity of care.

## 4.2 Restricted Control Group

I now turn to regressions using the control group composed of practices in the SELECT CONTROL group which have pre treatment characteristics and trends in outcomes (with the exception of the referral rate) that are statistically indistinguishable from the treated group. I report three sets of results: Tables 5 and 6 report results for different outcome variables relating to cost and quality respectively while in Table 7 I report further result on quality from specifications that use patient experience ratings from the GP patient survey as outcomes measures.

The columns in Tables 5 and 6 correspond to the first three specifications in Table 4; the final specification is dropped because there are fewer observations with the control group employed here. As before, standard errors are clustered at the practice level. The panels in each Table each correspond to a different outcome measure. I suppress the coefficients on controls for space reasons, highlighting the set of controls at the bottom of the Tables.

Looking along the rows findings seem to be reasonable consistent across specifications when using the restricted control group. The results in Table 5 illustrate that the coefficients on the



Table 4: *Unrestricted Difference-in-Difference Approach*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log prescribing costs per patient				Log avoidable admission (PAH) rate			
Gov.Body $\times$ post	-0.0084*** (0.0024)	-0.0081*** (0.0024)	-0.0059*** (0.0022)	-0.0057*** (0.0022)	0.0125* (0.0075)	0.0147** (0.0073)	0.0133* (0.0073)	0.0135** (0.0061)
GPs/1000 patients			0.0114 (0.0144)	0.0084 (0.0135)			0.0200* (0.0105)	0.0222** (0.0097)
% Aged 65+			0.0197*** (0.0014)	0.0189*** (0.0015)			0.0197*** (0.0031)	0.0162*** (0.0030)
% CHD			0.0124** (0.0052)	0.0148*** (0.0052)			0.0122 (0.0116)	0.0173 (0.0106)
% Stroke or TIA			0.0238*** (0.0061)	0.0209*** (0.0060)			-0.0019 (0.0168)	-0.0009 (0.0147)
% Hypertension			0.0034** (0.0014)	0.0028** (0.0014)			0.0037 (0.0035)	0.0020 (0.0031)
% Diabetes			0.0273*** (0.0032)	0.0272*** (0.0034)			0.0096 (0.0076)	0.0038 (0.0070)
% COPD			0.0133*** (0.0039)	0.0134*** (0.0038)			0.0227** (0.0103)	0.0304*** (0.0090)
% Epilepsy			0.0376** (0.0157)	0.0367** (0.0153)			0.0233 (0.0332)	0.0271 (0.0290)
% Hypothyroidism			0.0034 (0.0040)	0.0009 (0.0041)			-0.0447*** (0.0099)	-0.0070 (0.0096)
% Cancer			-0.0212*** (0.0046)	-0.0177*** (0.0046)			0.0516*** (0.0114)	0.0179* (0.0098)
% Mental Health			0.0345*** (0.0133)	0.0263** (0.0117)			0.0473** (0.0211)	0.0480*** (0.0153)
% Heart Failure			-0.0073 (0.0065)	-0.0138** (0.0065)			-0.0392** (0.0171)	-0.0261* (0.0153)
% Palliative			0.0013 (0.0051)	-0.0034 (0.0056)			0.0181 (0.0162)	-0.0061 (0.0126)
% Dementia			0.0212*** (0.0068)	0.0255*** (0.0069)			0.0549*** (0.0177)	0.0396*** (0.0148)
% Kidney Disease			-0.0032** (0.0013)	-0.0032** (0.0014)			-0.0052* (0.0027)	-0.0005 (0.0026)
% Atrial Fibr.			-0.0135** (0.0067)	-0.0122* (0.0066)			0.0470*** (0.0169)	0.0426*** (0.0148)
% Obesity			0.0007 (0.0007)	0.0003 (0.0007)			-0.0014 (0.0015)	-0.0001 (0.0014)
% Learning Diff.			0.0053 (0.0088)	0.0060 (0.0085)			0.0070 (0.0231)	0.0011 (0.0217)
Practice FX	✓	✓	✓	✓	✓	✓	✓	✓
Year FX	✓				✓			
Region-Year FX		✓	✓	✓		✓	✓	✓
PCT-Year FX				✓				✓
CCG-Year FX				✓				✓
Observations	88032	88032	88032	88032	88032	88032	88032	88032
R-squared	0.942	0.943	0.948	0.952	0.728	0.733	0.735	0.770

Notes: Standard errors in brackets, clustered at the practice level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

difference-in-difference estimate for prescribing costs is larger than previously, roughly double in magnitude. The previous evidence shows that pre reform trends in the referral rate were non-parallel. For completeness, I report this in panel B but in any case the coefficient can not be distinguished from zero (despite being consistently negative). In the panel beneath the dependent variable is the proportion of referrals that ended in a discharge at the first appointment, which is used as a measure of inappropriate referral activity by some CCGs (note that the dependent variable is scaled to be in the range 0 to 100). The coefficient of interest stable and weakly significant in the three specifications and suggests governing body practices reduced the proportion of referrals that ended at the first outpatient appointment by 1%.

The results in Table 6 implies that the effect of governing body membership on the avoidable hospitalisation rate is again larger than previously, also by a factor of around 2. The results in panel D are weakly significant. In panel E I tweak the set up so that the sample only includes 2009/10 and 2012/13 (and hence the treatment period is solely quarters in 2012/13). Here the coefficients become larger and more precisely estimated which is consistent with the effect being greater in this latter financial year of the reforms.

The final two panels in this Table are included as placebo checks. In the first I take the rate at which patients are admitted to hospitals in emergencies with conditions that are not deemed to be avoidable with primary care. The coefficients are close to zero and not significant. In the final panel I use the average inpatient waiting (the time between the decision to admit and the admission). I use this rather than the outpatient waiting time (the time between the GP referral and a patients seeing a consultant for an outpatient appointment) as it seems unlikely this could be influenced by GPs. Again, the coefficients are small and not significant.

My final set of results in Table 7 looks more at a different aspect of quality by focusing on patient experience, using an identical practice level set-up (with the restricted control group) as previously but now using data for the second quarter of 2010, 2012, and 2013 — corresponding to the June 2010, 2012 and 2013 NHS Patient Surveys. I extracted data for responses to 8 questions that are consistent between these surveys regarding overall satisfaction (would you recommend the practice?), waiting times (are you satisfied with opening hours?), confidence in the GP, and ratings of the GP on 5 different dimensions. Since the weighting system changed during this time, I use the unweighted responses to questions and include socio-economic and demographic controls and the survey response rate on the right hand as controls (share unemployed, share aged 65+, share ethnicity white, share male).

In the first column, I use the PAH rate as the outcome in this set up which includes a smaller number of quarters and a greater range of controls as a further check on the robustness of the result. The results demonstrate that the effect remains of the same magnitude and is still weakly significant. The coefficients on the interactions of interest are not significant for the majority of outcomes, indicating that becoming part of a CCG governing body has had no effect on patients' overall satisfaction, confidence in their GP, or satisfaction with opening. However, the findings in this table do suggest that GPs at treated practices were perceived to be significantly less good at listening to their patients and explaining tests and treatments to them. While I have no evidence of pre treatment trends for these outcomes, they are consistent with falling quality in treated practices in the transition.

Table 5: *Restricted Control Group, Cost Measures*

	(1)	(2)	(3)
<b>A: Prescribing Costs per patient</b>			
Gov.Body × post	-0.0148** (0.0064)	-0.0136** (0.0062)	-0.0123** (0.0057)
Observations	15744	15744	15744
R-squared	0.963	0.965	0.969
<b>B: Referral rate</b>			
Gov.Body × post	-0.0246 (0.0376)	-0.0387 (0.0356)	-0.0379 (0.0346)
Observations	15744	15744	15744
R-squared	0.860	0.870	0.871
<b>C: % Referred but discharged at first appt.</b>			
Gov.Body × post	-0.9797* (0.5797)	-0.9888* (0.5664)	-0.9892* (0.5697)
Observations	15744	15744	15744
R-squared	0.743	0.761	0.764
<b>Practice and Patient Controls</b>			
Practice FX	✓	✓	✓
Year FX	✓		
Region-Year FX		✓	✓
Patient and Practice controls			✓

Notes: Se's clustered at practice \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

Table 6: *Restricted Control Group, Quality Measures*

	(1)	(2)	(3)
<b>D: Avoidable hospitalisation rate</b>			
Gov.Body × post	0.0346* (0.0177)	0.0258 (0.0175)	0.0303* (0.0175)
Observations	15744	15744	15744
R-squared	0.900	0.903	0.903
<b>E: Avoidable hospitalisation rate, 2012/13 only</b>			
Gov.Body × post	0.0405** (0.0190)	0.0314* (0.0188)	0.0391** (0.0190)
Observations	10496	10496	10496
R-squared	0.900	0.903	0.904
<b>F: Other non-elective admission rate</b>			
Gov.Body × post	0.0079 (0.0128)	-0.0027 (0.0127)	0.0022 (0.0127)
Observations	15744	15744	15744
R-squared	0.819	0.827	0.829
<b>G: Average waiting time</b>			
Gov.Body × post	0.0002 (0.0103)	0.0044 (0.0101)	0.0042 (0.0102)
Observations	15744	15744	15744
R-squared	0.574	0.601	0.603
<b>Practice and Patient Controls</b>			
Practice FX	✓	✓	✓
Year FX	✓		
Region-Year FX		✓	✓
Patient and Practice controls			✓

Notes: Se's clustered at practice \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

Table 7: *Restricted Control Group: Additional Quality Measures*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
						PATIENT SURVEY			
						GP RATED GOOD OR BETTER %			
	PAH rate	R'mend practice %	Satisfied open hrs %	Confident in GP %	GP time	GP listen	GP explain	GP involve	GP manner
Gov.Body× post	0.0284* (0.0167)	-0.0032 (0.0057)	-0.0019 (0.0046)	0.0007 (0.0025)	-0.0022 (0.0036)	-0.0066* (0.0034)	-0.0077* (0.0044)	-0.0064 (0.0050)	-0.0060 (0.0039)
GPs/1000 patients	0.0249 (0.0398)	0.0106 (0.0141)	0.0034 (0.0109)	0.0174*** (0.0061)	0.0129 (0.0098)	0.0222** (0.0086)	0.0221** (0.0108)	0.0204 (0.0124)	0.0175 (0.0109)
% Unemployed	-0.2988 (0.1969)	-0.0708 (0.0634)	-0.0504 (0.0494)	0.0105 (0.0318)	0.0447 (0.0444)	0.1015** (0.0418)	0.0997** (0.0496)	0.0994* (0.0583)	0.0931* (0.0512)
% Aged 65 +	0.0483 (0.0607)	0.0332 (0.0213)	0.0590*** (0.0192)	-0.0004 (0.0106)	0.0093 (0.0152)	0.0142 (0.0143)	0.0235 (0.0176)	0.0387* (0.0207)	0.0217 (0.0176)
% Ethn. White	0.1601 (0.1763)	0.0796 (0.0530)	-0.0178 (0.0427)	-0.0125 (0.0250)	0.0372 (0.0339)	-0.0026 (0.0324)	0.0098 (0.0371)	-0.0207 (0.0473)	0.0246 (0.0403)
% Male	0.1541 (0.1601)	-0.0483 (0.0448)	-0.0034 (0.0391)	0.0302 (0.0205)	-0.0429 (0.0313)	-0.0197 (0.0296)	-0.0035 (0.0364)	-0.0293 (0.0406)	-0.0182 (0.0338)
Survey response rate (%)	-0.1049 (0.1245)	-0.0137 (0.0385)	0.0073 (0.0336)	-0.0303 (0.0198)	-0.0292 (0.0294)	-0.0140 (0.0274)	0.0165 (0.0329)	0.0116 (0.0378)	0.0072 (0.0316)
Disease prevalence controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Practice FX	✓	✓	✓	✓	✓	✓	✓	✓	✓
Region-Year FX	✓	✓	✓	✓	✓	✓	✓	✓	✓
PCT-Year FX	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	3266	3266	3266	3266	3266	3266	3266	3266	3266
R-squared	0.940	0.897	0.834	0.805	0.843	0.855	0.870	0.852	0.864

*Notes:* Standard errors clustered at the practice level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Disease prevalence controls are prevalence of the 16 health conditions used in earlier regressions. Unweighted GP patient survey results are for June 2010 (control) & June 2012 and June 2013 (treatment). Recommending GP surgery to someone who has just moved to the local area - Yes, would definitely recommend or would probably recommend. Satisfaction with opening hours - Very satisfied or fairly satisfied. Confidence and trust in GP - Yes, definitely, or yes, to some extent. GP ratings are % rating good or very good for: GP giving you enough time; GP listening to you; GP explaining tests and treatments; GP involving you in decisions about your care; GP treating you with care and concern.

### 4.3 Quantitative Interpretation

In this section I quantify the financial costs or savings associated with the findings for prescribing and avoidable hospitalisations. It is important to reiterate that these are not intended to describe the overall effects of the reforms since they describe outcomes of governing body practices relative to other practices during the transition. Further, I make no attempt to quantify a range of other costs and benefits, e.g. any saving or costs from changed referral behaviour, patient satisfaction, or indeed any wider costs associated with hospital admission (for example on the health and productivity of individuals, or on crowding at hospitals).

Based on the dataset described above there are 1,150 governing body practices, on average with 9400 patients which means roughly 10.8 million patients are registered at a practice represented on a CCG Board during the transition. The mean quarterly cost of prescriptions per patient is roughly £38 per patient. Using the coefficient in Table 5 of -0.0123 implies that a saving of 47p ( $= £38 * 0.0123$ ) per patient per quarter was saved in 2011/12 and 2012/13 relative to other practices, implying an overall saving on drugs of £40.6 million. Alternatively, using the coefficients in Table 4 would imply a saving of around half this amount, so that I estimate the savings in prescribing costs from practices are between £20 and 40 million over the two years.

The mean number of avoidable hospitalisation per 1000 patients per quarter is 5.9, so with 9400 patients each governing body practices has on average 55.5 avoidable admissions each quarter. Using the coefficient in Table 6 of 0.0303 implies an additional 1.7 in each practice each quarter, implying an additional 15,640 avoidable admissions across the 8 quarters. Tian et al. (2012) estimate the average cost of an avoidable admission to be £1,750 so this equates to a cost of roughly £27.4 million. The same calculation using the coefficient in Table 4 of 0.0135 implies additional financial costs of £12.1 million over the same period.

## 5 Discussion

The findings above suggest that — at least in the short-term — the effect of giving GPs budgets led GPs to engage in cost saving behaviour but also led to reductions in the quality of care. In this section, I discuss possible mechanisms may account for these effects in the context of the literature, although as with related literature (e.g. Gaynor et al. (2004)) I am unable to directly relate changes in outcomes to particular channels so this is essentially speculative.

A broad literature, including research on GP fundholding cited earlier, suggests that physician gatekeepers do respond to financial incentives. In the Appendix I sketch a simple model of GP behaviour under group based financial incentives that suggests if governing body GPs are able to appropriate resources from budget savings, they may be incentivised to engage in cost saving activity while other GPs do not. Of course appropriation relies on some mechanism for GPs on governing bodies to benefit from making budgetary savings. CCGs have awarded more than 400 contracts worth upwards of £2.4bn to organisations in which GP board members have a financial interest (Iacobucci 2015), which could be one such channel.

A second possibility is that participation on a governing body makes allocative efficiency issues more salient to GPs. Recognising the role of medical ethics in determining professional norms in healthcare, models of GP behaviour often incorporate altruistic regard for patient's health or welfare into GP utility (Arrow 1963; McGuire 2000; Rebitzer and Taylor 2010; Clemens and Gottlieb 2014). Some researchers also posit that doctors' choices may reflect regard to the allocation of scarce resources between competing needs (Ellis and McGuire 1986; Blomqvist 1991; Chandra and Skinner 2012). In a controlled experiment analysing tradeoffs in physician decisions, Kesternich et al. (2015) find that efficiency concerns influence choices even when medical ethics are made salient to medical decision-makers. These authors argue that in reality costs to society are often not salient to physicians when deciding how to treat a patient. It seems plausible that direct budgetary oversight does just this.

Finally, the results on quality outcomes may reflect that the reforms distracted from patient care, a view expressed by the King's fund (Ham et al. 2015). Developing CCGs and taking on new commissioning duties during the transitional phase of the reform required time and effort on the part of the GPs involved. Practices were reimbursed for the time spent by GPs on commissioning duties, but it is uncertain how they adapted to provide patient care e.g. by sharing workload between remaining doctors, taking on new permanent staff, or by employing locums.

## 6 Conclusions

In this paper, I provide quantitative analysis of health care reforms that took place in England in the period 2010 to 2013. The central feature of the reform was to pass responsibility for commissioning services and associated budgets to groups of GPs. I aim to generate insights

about the effects of this change on practice level outcomes, distinguishing between outcomes that indicate a focus on saving costs, and those that indicate a focus on care quality.

The empirical work applies difference-in-difference techniques to practices with plausibly similar pre-treatment trends. Two caveats are that the findings are generated from the transitional phase of the reforms so by definition impacts estimated are short term and may or may not be a guide to the longer term impacts of the reforms. No attempt is made to capture potential costs or benefits that may arise slowly e.g. through service redesign. Secondly, estimates are generated by comparing GP practices most closely associated with the reforms with other practices. However, all GP practices in my sample became commissioners so this relative effect may not be representative of the overall short term effect.

Notwithstanding these caveats, findings suggest that practices most actively engaged with new responsibilities changed behaviour relative to other GPs in ways consistent with taking cost saving steps: prescribing a lower average value of drugs to each patient, and by reducing the proportion of referrals that were discharged at the first outpatient attendance. On the other hand, findings are also consistent with these same practices reducing the relative quality of care: having a greater proportion of patients avoidably admitted to hospital in an emergency, and falling patient satisfaction. The results on quality are only weakly significant, but consistent across a variety of specifications and are supported by placebo tests on related outcomes. I explore a number of explanations for these results, including that the reforms incentivised doctors to reduce quality in order to save cash or that they simply distracted those doctors most closely involved.



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## A Appendix

### A.1 Construction of Governing Body treatment measures

The treatment measure is a time invariant GP practice level categorical variable,  $GB_p$  which takes value 1 if the CCG has a GP on the governing body during the transition or 0 otherwise. I additionally construct a control group of practices that host a GP governing body member, but only outside the treatment window. Generating these variables at the practice level is challenging because of data constraints and is further complicated by a number of factors including GPs joining and leaving Board positions, and moving between practices. Constructing the indicators involved several steps: compiling a dataset linking individual GPs to CCG Board positions; linking GP employment histories since 1 April 2009 to the dataset; and finally, excluding a small number of practices from the sample, for the reasons set out below. There is no central and comprehensive database of CCG Board members so at all stages information is verified across different sources where possible, although in some places a degree of judgment was required.

For the first step, I requested the names, practices details, and Board membership details of all current and past GP members of CCG Boards via Freedom of Information (FOI) requests. Around half of the 211 CCGs returned useful information. The resulting GP practitioner dataset was reviewed against Governing Body details in CCG annual reports (largely for 2013/14), harvesting new data to fill gaps and correct transcription errors where necessary. A significant limitation is that the information provided (FOI requests) or reported (annual reports) usually dates only from the establishment of CCGs as a legal entities (April 2013). The upshot is that commencement dates for Board positions are commonly recorded as 1 Apr 2013. In the empirical work that follows, my “treatment” on period is the start of 2011/12 and I proceed as if governing body members had taken up their positions by that point. The assumption is based on information described in the paper e.g. the fifth wave of pathfinder GP consortia was formed in July 2011, covering some 97% of the population; news reports about individual CCG governing bodies and GP participation etc. The result of this first stage is a database of 1,629 GPs with indicators for GPs who held positions on the governing body throughout the transition (CURRENT BOARD) or held positions on CCG governing bodies but outside the treatment window of 1 April 2011 to 1 April 2013 (FUTURE BOARD).

To construct GP practice level treatment measures from this GP practitioner level data, I next

create job histories back to q1 2009/10 for individual GPs by matching the GP name to data held by the Organisation Data Service of the NHS Information Centre (file: egpcur<sup>21</sup>), using secondary sources where necessary to facilitate a match. I match GPs to practices and assign the individual GP indicator variable CURRENT BOARD or FUTURE BOARD to the practice. Note that I allow indicator variable to be assigned to multiple practices for the small number of GPs in the database registered to work at two practices (13 GPs) during the timeframe of investigation, and that there are around 50 practices which are associated with more than one GP in the database.

In a final step I exclude around 100 GP practices from the analysis: practices where the GP governing body member practices in a different CCG to where they act as a Board member; practices where a governing body GP left the practice before the end of Q4 2012/13; and practices where a GP played a role in the initial phases of the reform but did not ultimately become part of the governing body in place on 1 April 2013. This latter group is identifiable from information sources including (i) CCG annual reports and other Board documents (ii) responses to earlier FOI requests for details of clinical leads at CCGs during the transition (iii) letters from CCG leaders to national newspapers (iv) data released by NHS England.

## **A.2 ICD-10 codes used to calculate Avoidable Hospitalisation**

The Table below reproduces the ICD-10 codes in Purdy et al. (2009) Table3 (wider set of diagnosis codes) but excluding dental problems. These are the ICD-10 codes used in this paper to define potentially avoidable hospitalisations.

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<sup>21</sup>See <[www.systems.hscic.gov.uk/data/ods/datadownloads/gppractice](http://www.systems.hscic.gov.uk/data/ods/datadownloads/gppractice)>

Table A1: *ICD-10 codes used to define potentially avoidable hospitalisations*

Condition	ICD-10 codes
Angina	I20, I24.0 I24.8 I24.9 I25 R072 R073 R074 Z034 Z035
Asthma	J45 J46
Cellulitis	L03 L04 L08.0 L08.8 L08.9 L88 L98.0 I891 L010 L011 L020 to L024 L028 L029
Congestive heart failure	I11.0 I50 J81 I130 I255
Convulsions and epilepsy	G40 G41 R56 O15 G253 R568
Chronic obstructive pulmonary disease	J20 J41 J42 J43 J47 J44 J40X
Dehydration and gastroenteritis	E86 K52.2 K52.8 K52.9 A020 A04 A059 A072 A080 A081 A083 A084 A085 A09 K520 K521
Diabetes complications	E10.0–E10.8 E11.0–E11.8 E12.0–E12.8 E13.0–E13.8 E14.0–E14.8 E139 E149
Ear, nose and throat infections	H66 H67 J02 J03 J06 J31.2 J040
Gangrene	R02
Hypertension	I10 I11.9
Influenza and pneumonia	J10 J11 J13 J14 J15.3 J15.4 J15.7 J15.9 J16.8 J18.1 J18 J189 J120 J121 J122 J128 J129 J160 A481 A70x
Iron-deficiency anaemia	D50.1 D50.8 D50.9 D460 D461 D463 D464 D510–D513 D518 D520 D521 D528 D529 D531 D571 D580 D581 D590–D592 D599 D601 D608 D609 D610 D611 D640 to D644 D648
Nutritional deficiency	E40 E41 E42 E43 E55.0 E64.3
Other vaccine-preventable diseases	A35 A36 A37 A80 B05 B06 B16.1 B16.9 B18.0 B18.1 B26 G00.0 M01.4
Pelvic inflammatory disease	N70 N73 N74
Perforated/bleeding ulcer	K25.0–K25.2 K25.4–K25.6 K26.0–K26.2 K26.4–K26.6 K27.0–K27.2 K27.4–K27.6 K280–282 K284–K286 K920 K921 K922 K20x K210 K219 K221 K226
Pyelonephritis	N10 N11 N12 N13.6 N300 N390 N159c N308 N309

### A.3 A simple model of GP behaviour under CCG group incentives

To consider the effects of the reforms introducing financial incentives, I sketch a simple numerical two period model in which group incentives are activated only in the second period. Following Rebitzer and Taylor (2010) I assume GPs follow professional norms such that they incur disutility when service level  $m$  (in £) is below some “ideal” level of care  $m_B$  which together with wages determines GP  $j$ ’s utility. In the first period, GPs have the common following utility:

$$u_j = \underbrace{w_j}_{\text{wages}} + \underbrace{f(m_j - m_B^j)}_{\text{professional norms}}$$

Following the reforms (period 2), CCGs become responsible for design of local services & staying within budget. I assume that membership of a CCGs now provides an additional source of utility to all  $n$  member practices via a group financial incentive where savings in practice patient care budgets  $B_j$  are shared equally between practices.<sup>22</sup>

$$u_j = \underbrace{w_j}_{\text{wages}} + \underbrace{f(m_j - m_B^j)}_{\text{professional norms}} + \underbrace{\frac{1}{n} \left[ \sum_{j=1}^n (B_j - m_j) \right]}_{\text{group incentive}}$$

I consider a simple numerical example with 2 GPs and that choose a level of care  $m_j \in (0, 1)$  where 0 indicates patients receive a low level of care (e.g referrals and prescriptions) and 1 a high level. Further I assume that the budget  $B_j = m_B = 1$ ; & that  $f(m_j - m_B) = -0.5(m_j - m_B)^2$ . It is trivial to show that prior to the reforms, both GPs play high to avoid the penalty from providing a low level of care. The payoff matrix below shows the utility in period 2. Here, there is no dominant strategy; each GP has no unilateral incentive to start playing low abut if the GPs can coordinate to both play low, utility is maximised.

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<sup>22</sup>This is not permissible under the reforms. However, it might also be the case if, for example, savings on commissioning budgets were reinvested in primary care services and all GPs in the CCG collectively own these.



		GP 1	
		$m_1 = 0$	$m_1 = 1$
GP 2	$m_2 = 0$	$w + 0.5$	$w + 0.5$
	$m_2 = 1$	$w$	$w$

This simple model illustrates the potential conflict of interest if GPs can appropriate savings from reduced patient care, but is not able to explain the divergence between CCG governing body practices and other practices observed in the data. I now consider a second scenario in which I make the strong assumption that GP 1 sits on a CCG governing body and can appropriate the savings from patient care budgets for his own benefit, such that it wholly benefits GP 1. Now, following the reforms, GP 2 has a dominant strategy of playing high & GP 1 has a dominant strategy of playing low.

		GP 1	
		$m_1 = 0$	$m_1 = 1$
GP 2	$m_2 = 0$	$w + 1.5$	$w + 1$
	$m_2 = 1$	$w - 0.5$	$w$

These models are not intended to be realistic and make very strong assumptions about how savings in commissioning budgets can be appropriated, but are useful in illustrating why governing body GPs may have stronger incentives to make cost saving measures than other GPs and hence to explain the observed patterns in the data.



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